

REMARKS

Applicants have amended Claim 6 to specify the rate at which phosgene is introduced into the reaction mixture. Support for the amendment with respect to the total quantity of phosgene can be found in the specification at page 4, line 31, through page 5, line 3 (with the approximation of about 1.2 to about 2.5 mol of phosgene being inherent in the phrase "generally between 1.2 and 2.5 mol") and support with respect to the metering rate for phosgene can be found in the same part of the specification taken with page 5, lines 29-30, and the examples. With respect to the phosgene rate, for example, the introduction of 1.2 mol of phosgene per mol of phthalic anhydride over a period of 5 hours corresponds to a rate of 0.24 mol/hr and the introduction of 2.5 mol of phosgene per mol of phthalic anhydride over a period of 15 hours corresponds to a rate of 0.17 mol/hr. In addition, Example 1 specifically describes the introduction of 0.2 mol of phosgene per 1.0 mol of phthalic anhydride each hour in seven portions over a period of six hours. (Examples 2 and 3 describe the introduction of 28 g (i.e., 0.283 mol) of phosgene at 45 minute intervals, which corresponds to an hourly rate of 37.3 g/hr, or 0.38 mol/hr, for phosgene.)

Rejection under 35 U.S.C. 103

Claims 6-14 stand rejected under 35 U.S.C. 103(a) as being unpatentable over JP 56-103131 ("Nagata et al"). Applicants respectfully traverse.

Because the details of the teachings of Nagata et al are not entirely clear from the abstract provided with the Office Action, Applicants have obtained a translation of the entire Japanese patent (copy attached). Although not certified, the translation was provided by a Japanese patent firm and is believed to be accurate.

Nagata et al discloses a process for preparing carboxylic acid chlorides such as phthaloyl chloride by reaction of the corresponding carboxylic acid anhydride with phosgene in the presence of a catalyst such as dimethylformamide (i.e., DMF) at 50°C to 120°C, where the phosgene is fed into the reaction mixture at a rate such that unreacted phosgene is essentially undetectable in the waste gas. E.g., English abstract provided with the Office Action. The Office Action indicates that the reaction produces product in a yield of 99% (with reference to the lower right corner of page 2 of the Japanese language document, by which Applicants assume is meant the bottom right of page 342). In the process disclosed in Nagata et al, it appears that dimethylformamide is already present before phosgene is introduced. Furthermore,

Nagata et al specifically teaches that the rate at which phosgene is introduced must be low to avoid converting the catalyst to a tar-like substance. See translation at bottom of page 4. Even more specifically, Nagata et al teaches in the examples that introduction of phosgene at rates greater than 10 g/hr – even at the only marginally greater rate of 11 g/hr – provide inferior results. Compare yields of phthalic acid chloride of about 99% for Example 1 (using a phosgene rate of 7 g/hr per 0.5 mol of phthalic anhydride, which corresponds to 0.14 mol/hr per mol of phthalic anhydride) with a yield of 85% for Comparative Example 1 (using a phosgene rate of 11 g/hr, which corresponds to 0.22 mol/hr per mol of phthalic anhydride) and an even lower yield of 52% for Comparative Example 2 (using a phosgene rate of 14 g/hr, which corresponds to 0.28 mol/hr per mol of phthalic anhydride).

Applicants note by way of comment that Example 3, which used a phosgene rate of 10 g/hr, describes the preparation of the non-aromatic compound succinic acid chloride from succinic anhydride instead of the aromatic compound phthalic acid chloride from phthalic anhydride as in the other examples, meaning that the reported high yield of succinic acid chloride is likely to be of little relevance to the preparation of phthalic acid chloride, especially in view of the lower yields obtained for phthalic acid chloride in Comparative Example 1 using a similar phosgene rate.

In contrast, Applicants require the introduction of both the phosgene and the N,N-dialkylformamide over the course of the reaction. Although the Office Action at page 3 asserts that it would have been obvious to optimize the prior art process using known continuous or discontinuous metering methodologies. Applicants respectfully submit that those skilled in the art would not be led by a reference that teaches a method in which only one of the reagents – phosgene – is metered in to an already formed mixture containing the carboxylic acid anhydride and DMF under very specific conditions (i.e., low rate) to a method such as claimed by Applicants in which two reagents – phosgene and an N,N-dialkylformamide – are independently metered in to the carboxylic acid anhydride component. For this reason alone, Applicants believe their claimed process is distinguishable from Nagata et al.

Furthermore, in Applicants' process as now claimed, phosgene is introduced at a rate greater than what Nagata et al teaches will produce inferior results, yet Applicants consistently obtained yields of around 90% at these higher rates. See Example 1 (87% yield at a phosgene rate of 19.8 g/hr, which corresponds to

0.20 mol/hr per mol of phthalic anhydride) and Examples 2 and 3 (91% yield for each at a phosgene rate of 28 g in 45 minutes, which corresponds to 0.38 mol/hr per mol of phthalic anhydride). The reference provides no motivation or suggestion to alter the reaction as suggested in the Office Action or to use phosgene rates greater than 0.2 mol/hr per mol of phthalic anhydride. Since Nagata et al teaches a method in which only phosgene is introduced at a controlled rate and further teaches that the rate must be kept low to avoid degrading the catalyst, Applicants submit that those skilled in the art would not be led by the reference to the parameters they specify. Applicants respectfully submit that Nagata et al does not render their claimed invention obvious.

In view of the preceding amendments and remarks, allowance of the claims is respectfully requested.

Respectfully submitted,

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